

Aims of Wood Finishing

1. Wood finishes are mainly applied to protect the wood and improve its appearance. It is essential to select the right coating system for a particular product to meet the overall product performance requirements.
2. Applying an unsuitable coating system or not following the specification for finishing procedure will reduce the appeal and overall durability of the product.

Important information for the Quality Controller

Achieving a good quality finish on wood involves a combination of three major factors:

1. Selection of coating system.
2. Wood surface condition.
3. Finishing treatment applied to wood.

All the three factors have an equally important role in obtaining high quality finish and they must be considered in the overall manufacturing process.

In most cases finish related problems are not caused by the failure of the finish itself but rather by the poor selection of the type of finish incorrect preparation of wood surface prior finishing and/or improper application of the finish.

How to select a proper wood finish for a particular product?

The key questions which need to be asked before selecting the suitable finishes are:

- What type of timber will be coated? For example, open grained woods may require filling, especially if a high gloss finish is desired.
- Will the product be used indoor or outdoor?
- Do you want to bring out the grain, enhance it or cover it up?
- Do you want the finish to be glossy and soft, or bright and colourful?
- Do you want the piece to blend in well with surrounding wood surfaces, or to offer a sharp contrast?

Checklist for Quality Controller of Finishing Process

- Will the product be exposed to heat, moisture, liquid and chemicals spills, or to heavy use (for example, kitchen table, kitchen bench, school desk)?
- What type of equipment do you have in the factory available for the finishing jobs?

Attention: Ask the supplier/producer of your finishes for advice on the most suitable finish system which would meet the desired selection criteria.

In most cases finish related problems are not caused by the failure of the finish itself but rather by the poor selection of the type of finish incorrect preparation of wood surface prior finishing and/or improper application of the finish.

Quality control procedure for finishing operation

- ✓ Check the type of finish used for the product. Check if it was properly selected for:
 - The type of timber used.
 - The type of product used and its application (for indoor or outdoor use; for heavy, medium or light use).
 - Read the finish specification provided by the supplier/producer and make sure that the requirements and safety procedures can be fully applied in the factory.
- ✓ Make sure that all the components of a finish are compatible and come from one supplier/producer. Problems often occur if components of the finishing system (e.g. seal and lacquer) are incompatible with each other.
- ✓ Check the equipment which is used for the finishing job:
 - Is the equipment working properly? When it was checked last time?
 - Check if the equipment is clean.
 - Check if the equipment is safe to be used.
- ✓ Check the moisture content of wood with a calibrated moisture meter:
 - The moisture content of components to be finished must be between 10-12%.
 - Reject the components which have higher or lower moisture content. They need to be conditioned until the correct moisture content is achieved.

Checklist for Quality Controller of Finishing Process

- ✓ **Check the quality of wood surfaces before applying the finish:**
 - *The wood surfaces must be free from dust, marks, grit, indentations, oil, wax and other contaminants.*
 - *Check if there is any sign of glue that has squeezed out. Glue will not take stain and it is essential that every spot of glue has been removed. Glue around joints can be removed with a scraper or sharp chisel once it has thickened.*
 - *Check if the wood surfaces are even and smooth. Is there any sign of raised grain or cutter marks or chip imprints visible on the wood surfaces? If they are, they must be removed.*
 - *Are there any raised or sunken joints due to poor gluing procedures? They must be removed.*

- ✓ **The quality of wood surfaces is highly dependent of the quality of sanding operation. Check if the sanding procedures are properly applied:**

Quality control procedures for sanding operation

Sanding is done to remove the first wood layers, producing a smooth and uniform surface and also eliminating blemishes due to previous operations such as gluing.

- ✓ **Check the type of wood used for finishing before starting sanding. The type of wood to be sanded has a direct relationship to the grit of paper used for final sanding.**
 - *The grade, or grit, of sandpaper is based on the number of sand granules per square inch of paper. The higher the number; the finer the grade. Lower-numbered grades denote coarser sandpaper. The grit number is generally printed on the back of each sheet.*

Guidance for sanding appearance wood products provided below:

Grit Guide	
Very Fine (220)	For light sanding between stain and sealer.
Fine (150-180)	For final sanding or cleaning of wood surfaces.
Medium (100-120)	For moderate removal of surface imperfections.
Course (60-80)	For heavy removal of wood and coatings.

Checklist for Quality Controller of Finishing Process

- *Softwoods can be finish sanded with 150 or 180 grit prior to the application of primer.*
- *Hardwoods used in furniture and other appearance wood products fall into two categories: closed grain and open grain. Open grained hardwoods can often be finish sanded with 220 grit.*
- ✓ **Check if the sanding is done in the direction of the grain; it should never be done perpendicular to it or at an angle.**
- ✓ **Check the sequence of sandpaper grades used.** After you pre-determine the final sanding grade for you project by using your test block determine your starting grade for sanding by testing to see if that final grit size effectively removes the surface defects. If it doesn't, then use the next coarsest grit in the grade sequence and start again. **Do not skip more than one grade between sanding steps. For example if you started with 100 grit and that is not your last sanding grade then you can skip 120 grit and go to 150 grit to complete the job.**
- ✓ **Clean all surfaces with a tack cloth.**

Procedures for handling the finished products

- ✓ Make sure that sufficient time is allowed for lacquers to cure thoroughly before handling and packaging. Otherwise damage to the lacquer will occur.
- ✓ The finished products should not be placed into enclosed boxes too soon after lacquering, as there will not be sufficient air circulation to cure the lacquer.
- ✓ The finished products should not be stored in damp, draughty or hot warehouses or factories.
- ✓ Maintenance instructions should be provided by your company for the buyers of the products. In particular, if an inappropriate cleaning agent is used regularly it will damage the coating and allow moisture ingress. This will lead to the loss of gloss, whitening, and surface checking.
- ✓ The finishing operators' skills should be regularly assessed and recommendations provided for improvements and additional skills.
- ✓ Make sure that the operators are regularly trained, in particular if new finishing products, new equipment or new type of timber are introduced into the factory production system.

Safety requirements for finishing operations

Any finishing operation involves the use of hazardous chemicals. Inhalation of fumes and skin contact with some chemicals can be hazardous. Special precautions are necessary to insure their safe use to protect the operators.

- ✓ **Make sure that the safety recommendations about using various finishes are strictly followed by the finishing workers.** In particular, make sure that the workers:
 - Always work in a well-ventilated area with an exhaust system or fan.
 - Wear solvent or chemical resistant rubber gloves and safety goggles.
 - Wear a protection mask or appropriate respiratory protection.



✓ Safety Goggles



✓ Working Gloves



✓ Mask

Typical defects related to improper finishing and their possible causes

Crazing of the surface

Crazing, also named “cracking”, is a common problem and gives a visual appearance like fine random crack lines, which are apparent both along and across the grain of the veneer.

There are many forms and degrees of crazing and there are a number of immediate causes.

Usually the crazing is caused by one of the following faults.

- The formulation of the lacquer being too brittle. A properly formulated lacquer should include a plasticiser, which will allow flexibility of the coating, therefore reducing the risk of cracking.
- Each subsequent coating has been applied too thickly, particularly if the successive coatings are applied over too short a time, leading to excessive solvent retention and consequential movement underneath the top surface when it is dry.
- The use of a hard finish over a soft one or of a fast drying material over a slow drying one.
- The mixing of incompatible materials.
- Rapid and/or large changes of temperature and relative humidity
- Undercoats that are thinned excessively and applied to inert fillers.

Crazing is more likely to occur as the “build” of the lacquer increases. The lacquer applied to a tabletop or sideboard top may craze within a few months while the same lacquer applied to vertical surfaces remains free from cracks. This difference in performance can be attributed to the heavier coating of the tops.

The remedy is to ensure a thinner initial application coat and to allow ample time for drying between coats.

Cracking down to the wood usually requires the complete removal of the coating and repainting. In cases where cracking occurs over veneer or plywood, there is not much that can be done to remedy the cracking besides periodic sanding and recoating.



Crazing of finished surfaces

Orange peel

“Orange peel” is the name given to an uneven, rippled lacquer surface. It is so named because the pattern resembles the texture of the outside surface of an orange.

It is usually associated with improper spraying technique. For example:

- spraying too thick a liquid with too little air pressure. The remedies are, therefore, to increase air pressure, to thin the liquid, or both
- holding a spray gun too close or too far from the surface
- spraying too slowly
- improper evaporation of solvents preventing flow out of the material during the drying cycle.

Orange peel may also occur in curtain coating and is then due to physical properties of the material coupled with the drying parameters.



Example of orange peel

Blushing

Blushing is a milky-white appearance in the finish caused by the condensation of airborne moisture in a finish cooled by evaporating solvents. On warm, humid days, moisture in the air condenses onto the surface of the finish because of cooling brought about by the rapid evaporation of the solvent. If the finish then cures before the moisture has time to evaporate off the surface, the moisture interferes with the proper curing, causing a milky-white appearance of the finish.

The remedy is firstly to ensure that the spray shop is as dry as possible. A slower evaporating lacquer thinner can be also added to the finish to slow the solvent evaporation and the curing of the finish.

Once blushing occurs, it can be removed by spraying a retardant onto the surface or by rubbing with an abrasive, such as steel wool. As blushing almost always occurs right at the surface, rubbing usually removes the problem with little risk of cutting through. Note that water-based finishes do not blush as they already contain significant amounts of water.



Blushing problem

Blistering

Blisters are defects in finished wood products, usually visible as elevations on the finished surface that look like skin blisters. There are two main types of blisters – those caused by heat and those caused by moisture.

Blistering can be caused by moisture, particularly in winter months. Interior moisture in tightly constructed homes is a major cause of exterior paint blistering. Moisture bubbling up inside the house escapes through the walls because there is no place else for it to go. In the summer, the sun heats the siding, and the water trapped behind the paint film is vaporised. The resulting pressures cause blistering.



Blistering

Overspray

Overspray, or dry spray, is a sandy appearance and feel on the finished surface caused by the spray drying too much before it hits the surface. Causes include:

- too much air pressure or bounce back from spraying too close to the surface
- excessive air flow pre-dries the atomised lacquer before it can reach the surface (such as when spraying outdoors on a windy day).



Overspray of finished surface

White-in-the-grain

This problem usually occurs due to trapped filler solvent, which is a non-solvent for the lacquer, thus precipitating the lacquer solids. The condition is aggravated by the use of inferior lacquers with weak solvent mixtures and the consequent low tolerance for excess non-solvent.

Prevention is simply a matter of using faster drying filler or allowing a longer drying time. A better quality lacquer will reduce the possibility of the failure.



White-in-the-grain finish problem

Cissing or “fish-eye”

Cissing, also called “fish-eye” or cratering, is the appearance of small, crater like holes or indentations in the finish, resembling craters on the moon. Small impurities are often visible in the centre of the crater.

Cissing is caused by a difference in surface tension between an oily substance in the wood and the finish. The most common reasons for this are:

- silicone in the environment or on the surface of the substrate – even minute traces are sufficient to cause cissing
- contamination by other sources, such as grease, dried soap, detergent, spray dust, wax, or oil from the spray gun
- incompatible elements in the primer
- saturation by fumes in the spray booth.

There are a number of remedies that may assist in avoiding cissing.

- Thoroughly clean any silicone polishes from the surface to be painted and avoid using silicone polishes in the vicinity of the paint shop. Prepare the surface using the same preparation procedure as that set out below.
- Thoroughly clean the surface with wax and grease remover. Do not allow cleaning solvents to dry on the surface but remove with a clean dry cloth, using the cloth only once.
- Clean surfaces prior to sanding and always ensure that all sanding dust is removed. Prepare bare metal surfaces with metal conditioner. Repeat the solvent cleaning operation prior to commencing spraying. Ensure that the spray gun and compressed air equipment are properly maintained.

Checklist for Quality Controller of Finishing Process

- Always use the recommended materials.
- Ensure that the spraying area is properly ventilated.
- Remove the paint completely from the affected area, and repaint, following the recommended preparation procedure
- In extreme circumstances it may be necessary to use an anti-cissing additive. Always consult the paint manufacturer before using such additives.



Cissing problem

UV discolouration of coated wood surfaces

Discolouration of wood by UV light occurs mainly due to exposure to sunlight. The exposure to sunlight results in a gradual bleaching of red/dark woods and a yellowing of blonde woods. Such changes are limited to the surface layers of wood and the original colour can be regained by sanding or planing the surface. UV inhibitors should be added to finishes to reduce the yellowing effect on lighter timbers. Therefore it is highly recommended that appropriate UV protective coating should be used to eliminate the discolouration of wood surfaces.